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ABSTRACT

Activities related to the introduction of computers and computer assisted instruction into Bavarian schools are described, including the inservice teacher training, information dissemination, and consultation activities of the Zentralstelle (Center for Programmed Instruction and Instructional Computer Applications). Also described are model experiments conducted since 1976/77 by the Bavarian Ministry of Education to test hardware and its suitability for schools, to develop software for use by school administrators, to develop educational software and sample lessons for instruction, and to test computer assisted instruction in everyday class use. The acquisition of computer equipment by schools is described and a model for inservice training in the use of computers is presented. Finally, information is given on the number of Bavarian schools possessing computers (by type of school) and the number of computer programs (by subject or application) purchased by schools and available for exchange. (ESR)

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Bavarian Experiences with Computers and Education.
Implications for a Policy

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Preparatory phase

In 1981 the decision was taken to introduce computers generally into Bavarian schools. Since the end of the sixties the basis had been laid for this general introduction by

- a research project on computer assisted instruction using a large computer and a greater number of displays
- various individual activities of teachers in optional courses
- developing curricula and books aiding the teachers, called "Handreichung", with comments, illustrations, examples etc. for different types of schools
- charging the Zentralstelle in Augsburg to give support to Bavarian schools
- organizing inservice training for teachers
- inviting firms to make offers concerning computers and equipment
- model experiments in co-operation with about 50 schools in the field of multifunctional use of the computer
- developing software for school administration

Due to these activities a stock of teachers was created with profound experience and background in data-processing. In the following I will go into details on two of the points mentioned above.

The Zentralstelle

The "Zentralstelle" (Centre for programmed instruction and instructional computer application) was created in 1968. Among other activities it carried out the research project on CAI mentioned above. So already a number of experienced experts were available

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when it was charged in 1977 to give support to all schools in Bavaria. During the ensuing years the following activities were carried out:

- organizing inservice training
- writing papers for teachers in order to avoid inefficient parallel activities
- standardizing documentations for instructional programmes
- organizing an exchange of programmes
- editing a journal called "BUS" to keep teachers currently informed and to enlarge their knowledge
- establishing a file on disk concerning the equipment of all schools with computers
- defining the tasks of the teacher in charge of the computers at the schools
- informing the headmasters of schools concerning the possibilities and the problems involved in the use of computers
- developing programmes
- testing programmes
- observing the market for computers, peripheral equipment, interfaces and software
- giving advice to schools concerning their equipment with computers
- cooperation with other institutes, organisations and other countries

I would like to point out some of the difficulties that arose in some respects:

It has turned out to be of great importance that documentations should not only describe the programme itself but also its use in class to give the teachers the necessary information and suggestions especially when it is used in other subjects than informatics. It is this aspect, in the documentations, however, that is often dealt with in a unsatisfactory way by the teachers.

As to the exchange, initially, we were glad that schools offered us programmes at all, which we all accepted. But it is absolutely necessary to test the programmes - their quality not always being

satisfactory - and to improve them in accordance with the author. This procedure takes plenty of time. During our CAI project we worked out models for the development and the evaluation of instructional programmes which we can use in class.

As to the articles for the "BUS" journal, partly written by teachers, we had to see that they were based on practical experience. Subjects being too special or theoretical should not be dealt with. Tricks of programming depending on the special computer in use are of minor importance.

The tasks of the teacher in charge of the computers at school turned out to require plenty of time. The relief the teachers are normally granted is not sufficient. A great deal of the activities are only possible because the teachers sacrifice a large amount of their spare time for them. The headmasters of the schools should be particularly aware of this fact.

Model Experiments

Since 1976/77 the Bavarian Ministry of Education in cooperation with the Federal Ministry of Education and Research has been carrying out model experiments on multifunctional use of computers in schools. Initially minicomputers and multiuser systems were used. since 1979 microcomputers have been in use. In these experiments about 50 schools of nearly all types are involved, the main objectives being

- testing of hardware and its suitability for schools
- developing programmes and organizational models for school administration via computer
- developing programmes and sample lessons for instruction
- and their testing in everyday use in class

While testing the hardware and finding out the necessities required by schools we had difficulties in keeping pace with technological development. Within a short time better and more efficient computers appeared on the market, which always

meant reorientation for the teachers. Due to the fact that the model schools had various types of the same computer in use we had to provide them with different versions of administrative programmes. This became particularly complicated through the diversity of peripheral equipment. Sometimes the mistake was made to forward programmes to schools which were not fully tested, so that they got into troubles when using them. Especially the administrative programmes should be evaluated only by a small number of schools, where the teachers are prepared to do it and are aware of the fact that mistakes are still possible. Otherwise trouble and aversions to the use of computers will arise.

It also occurred that teachers of other schools, interested in the subject, developed their own administrative programmes. As this had to be done in their spare time there was not enough time to detect all errors while debugging and give the programmes an easy handling.Thus the secretary using them got into troubles and the teacher was made the scapegoat despite the additional effort and time he had invested in this work. Therefore we flatly warn against the private development of administrative programmes.

Occasionally organizational problems arose concerning the input respectively the output of data and the updating service. This should be the task of the school secretary not the task of a teacher.

It also happened that the only printer available at a school or the floppy disk drive failed just at that moment when the school reports were to be printed. Therefore these peripheral units should be available twice. According to our experience schools should not be obliged to use the computer for administration. In some years they will be inclined to do it, when there will be good experience gained by many schools. The class-teacher should also have the choice either to fill in the school reports himself, only the personal data of the pupils being provided by the computer or to have the school reports completely printed by putting the pupils' marks into the computer.

Measures for general introduction of computers'

About two years ago the decision was taken that any pupil should be given the chance of acquiring basic knowledge in informatics and data processing during his schooltime. To achieve this an agreement between the Ministry of Education and the Treasury Board had to be made.

The first step was the conception of the equipment. In 1981 there was an invitation to computer-firms again. Due to the analysis of the offers the Bavarian state bought a homogenous equipment for a part of its own schools. The other school-authorities were recommended to buy the chosen computer-model. In this way we achieved:

- Some hundred schools use the same computer; that means that the same programmes can be developed for all of them. An exchange of programmes and results is possible. Inservice courses for teachers can be held using the same computers they have at their disposal in their schools.
- In talks with computer firms favourable conditions could be achieved as to the price, repairs and software. In particular the firm was asked to develop basic programmes for administrative use according to detailed requirements and to put them at the schools' disposition free of charge.

On the other hand planning the equipment of a large number of schools was of course more hampered by the scarce financial means of the public budget than that of single schools where sometimes better financial funds can be found. Therefore many a thing had to be canceled that would have been desirable as it was out of the question to favour some schools but to equip them all in the same sufficient way.

In the course of time new demands arose, for instance the transmission from a computer desplay to a TV screen and the combined access of several microcomputers to floppy disk drive and printer. This will save tackles and time with the teacher making duplicates of the disks and tapes.

In 1983 computer firms have again been invited to present their products and prices. According to plan 8 to 10 microcomputers are scheduled for each single school. However, many schools will get fewer at first, although the completion will be a problem because of the quick change of the types. It is absolutely necessary to have a separate computer room at one's disposal, which has space enough for a whole class. Actually it is not yet available everywhere.

Another initiative was the increase of inservice training. Informatics and data processing have become a main aspect of these inservice courses for teachers. The Zentralstelle was charged to organize these courses. In co-operation with other institutes we worked out a standardized concept. The main problem consists in the necessity that a large number of teachers have to attend these courses within a short time. Their capacity, however, is limited. The aim can only be reached if the necessary background is not only acquired in the courses but chiefly on one's own in private studies. To achieve this programmed instruction was used similar to proceedings in data processing industry. Thus the courses chiefly aim at encouraging and backing up private studies.To attend them only teachers are invited who already use a computer in their school. The following model was realized:

Introduction

- Preparatory studies using a programmed instruction textbook developed by the Zentralstelle and the corresponding exercises on the school computer.
- Two days' regional course dealing with programming and instructional use.
- Intensive training on the computer supported by working papers and further parts of the programmed textbook.
- Two days' regional course dealing with programming, instructional models, discussing the informatics curriculum.
- Intensive training on the school computer.
- Practical use in class.

Extension phase

- Preparatory work using the programmed textbook and the corresponding exercises on the school computer.

- One-week's central course at the Academy for teachers at Dillingen, covering programming, use of the computer in different subjects, general problems in informatics.
- Training the acquired procedures on the school computer.
- Practical use in class.

Special courses for instance in school administration via computer, taking one day, in which the teacher responsible for the computer and one leading member of the school will take part. The school secretaries will be instructed by the teacher later on.

The possibilities how to use the computers in the different subjects are best demonstrated by the presentation of detailed instructional examples.

Partly the teachers have basic background acquired autodidactically mostly by using the statement oriented not algorithm oriented introductory manuals edited by the producer. Particularly when using BASIC they have frequently acquired a rather awkward method of programming. In the inservice courses we therefore have got to emphasize the importance of structured programming and to point out the disadvantages of tricky programming.

Actual situation

The following survey shows the actual situation at Bavarian schools regarding their computer equipment. (There are not considered the primary schools.)

Kind of school	Tabular number of all schools	Schools with computers
Gymnasien	420	310
Realschulen	332	185
Wirtschaftsschulen	71	44
Fachoberschulen	59	55
kfm. Berufsschulen	130	68
sum	1012	622

On an average the schools with computers are equipped with three tackles only.

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About 1500 teachers from these 622 schools with computers took part in the introductory courses or acquired corresponding knowledge otherwise. About 500 teachers have the knowledge of the extension courses.

Besides informatics the list of programmes available for exchange comprises at the moment:

For the subject	Number of the programmes
Mathematics	314
Physics	75
Business Administration Accounting	74
other subjects	34
Games	25
Service programmes	19
sum	541

Each school gets a record of the available programmes. The school orders the disks, makes copies and sends them back not later than ten days afterwards. In addition the school gets the documentations to the programmes of its special interest.

The administration programmes with detailed descriptions can also be ordered. They include some service programmes as well, an editor for example.

This month we had a workshop about the activities in the last years. Members of the ministry, institutes concerned and lecturers of the inservice courses discussed the experiences and the problems. Some alterations for example in the courses and the development of programmes for use in class will follow.

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